

TEACHERS' ATTITUDES TOWARDS PROBLEM-SOLVING TASKS AS A MEANS OF DEVELOPING CREATIVITY IN PRIMARY MATHEMATICS EDUCATION

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Abstract: Creativity is increasingly recognised as an important dimension of mathematics education, particularly when pupils are encouraged to explore, formulate and solve problems in different ways. This study examines teachers' attitudes towards problem-solving tasks as a means of developing creativity in primary mathematics education. The empirical research was conducted in December of the 2024/2025 school year and included 46 teachers from grades one to five in three schools within the JU OŠ "Jovan Dučić" school network in the Banja Luka area. A questionnaire was used to examine teachers' attitudes towards the presence and frequency of creativity-oriented problem-solving tasks in mathematics textbooks and classroom practice, the use of open- and closed-ended tasks, the contribution of mathematics teaching and problem-solving tasks to creativity development, the importance of professional development, instructional guidance, and the role of textbooks. The data were processed using MS Excel 2019 and IBM SPSS Statistics 29.0.2. Descriptive procedures and chi-square tests were applied to analyse the obtained data. The results revealed statistically significant differences in teachers' responses concerning the frequency of using creativity-oriented problem-solving tasks, the perceived contribution of mathematics teaching and problem-solving tasks to creativity development, the use of open- and closed-ended tasks, professional development, and the role of mathematics textbooks. No statistically significant differences were found regarding teachers' perceptions of the presence of creativity-oriented problem-solving tasks in textbooks or the usefulness of instructional guidance. The qualitative analysis of examples provided by teachers further indicated difficulties in distinguishing genuinely open-ended problems from routine and non-routine structured tasks. The findings indicate that positive attitudes towards creativity need to be accompanied by stronger methodological competencies and systematic professional development. Particular attention should be given to the design and implementation of open-ended and cognitively demanding problem-solving tasks that encourage pupils to use different strategies, generate ideas, and develop creative mathematical thinking.

Keywords: *creativity, problem-solving tasks, open-ended tasks, primary mathematics education, teachers.*

Field: Social Sciences

1. INTRODUCTION

Creativity is increasingly recognised as an important dimension of mathematical learning, particularly when pupils are encouraged to formulate, explore, represent and solve problems in more than one way. Recent research confirms that creative problem solving is already observable in primary-school pupils and can be supported through appropriate mathematical learning environments (Van Hooijdonk et al., 2023; Bruhn, 2024). Contemporary research on mathematical problem solving additionally emphasises problem formulation and the diversity of ways in which learners approach and solve mathematical problems (Santos-Trigo, 2024).

Open-ended and cognitively demanding tasks are especially relevant because they can provide opportunities for fluency, flexibility and originality. Bruhn (2024) showed that young primary-school children can demonstrate mathematical creativity when working on open arithmetic tasks. Evidence from elementary mathematics classrooms also indicates that activities designed to promote creative problem posing and problem solving can strengthen mathematical creativity and creative self-efficacy (Hu & Wang, 2024). Moreover, research on originality in mathematical problem solving suggests that mathematical knowledge and conceptual understanding are closely related to pupils' ability to produce original solutions (2024).

The importance of the teacher is therefore not limited to presenting problems; it includes selecting, adapting and designing tasks and creating classroom conditions in which alternative strategies and mathematical explanations are valued. Research on teachers' creative actions in mathematics shows that creativity-supportive practices require teachers to move beyond routine procedures and provide opportunities for exploration and alternative solutions (Ye et al., 2024). Research on teachers' classroom

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practices further indicates that even when teachers have relevant knowledge, difficulties may remain in translating that knowledge into consistent creativity-supportive practice (Bicer et al., 2025).

Professional development is consequently an important condition for strengthening teachers' competence. Zioga and Desli (2025) found that an educational programme increased primary teachers' use of creativity-provoking tasks and approaches, although difficulties with originality and elaboration persisted. A related 2025 study on teachers' implementation of mathematical creativity-promoting tasks identified a continuing "creativity gap" between teachers' beliefs and classroom practices, particularly in the design and implementation of open-ended tasks (Zioga & Desli, 2025). These findings are directly relevant to the present study because they suggest that teachers' positive attitudes towards creativity do not necessarily guarantee the ability to construct appropriate tasks.

Curriculum and instructional materials also influence the opportunities pupils receive to engage in creative mathematical thinking. Recent research with elementary pupils shows that curriculum materials combining challenging and open-ended problems with collaborative and reflective work can increase the diversity and originality of problem-solving strategies (Wen & Zhang, 2025). Research on mathematical creativity in K–12 education likewise shows that problem solving and problem posing are among the principal ways through which mathematical creativity is conceptualised, while open-ended multiple-solution tasks remain central to its assessment (Mathematical Creativity: A Systematic Review of Definitions, Frameworks, and Assessment Practices, 2025).

Teacher competence in problem posing is another relevant dimension. A 2026 study demonstrated that targeted training based on narrative texts improved primary teachers' non-routine problem-posing skills and increased their awareness of problem posing (Yurtbakan et al., 2026). In addition, recent classroom research has shown that students can engage in individual and collaborative creative processes, while limitations in teachers' understanding of how to foster creativity may constrain these opportunities (Bicer et al., 2025). Thus, the quality of professional support, tasks and classroom implementation should be considered together.

In the regional context, recent research on the integration of mathematical modelling tasks in primary education in Croatia and Slovenia points to differences in teachers' use of open and modelling-oriented tasks and highlights the importance of teacher preparation (Sabo Junger et al., 2025). These findings reinforce the need to examine not only whether teachers value problem solving and creativity, but also how prepared they are to select and formulate tasks that provide genuine opportunities for creative mathematical thinking.

The present study therefore examines teachers' perspectives and reported practices concerning problem-solving tasks as a means of supporting creativity in younger primary-school pupils. The focus is placed on the presence and use of creativity-oriented tasks, the balance between open- and closed-ended problems, the perceived role of textbooks and instructional guidance, and the importance of professional development. The aim is to identify both strengths in current practice and areas in which methodological support is needed.

2. METHODOLOGY

The study used theoretical and empirical methods. The empirical part was based on a questionnaire administered to 46 teachers who teach grades one to five in three schools belonging to the JU OŠ "Jovan Dučić" school network: the central school in Zalužani and branch schools in Kuljani and Priječani, in the Banja Luka area. The research was conducted in December of the 2024/2025 school year. Data were prepared in MS Excel 2019 and analysed using IBM SPSS Statistics 29.0.2.

The questionnaire examined teachers' perceptions of: (1) the extent to which mathematics textbooks contain creativity-oriented problem tasks; (2) the frequency with which teachers use such tasks; (3) the perceived contribution of initial mathematics teaching and problem tasks to creativity; (4) the relationship between mathematics and creativity; (5) the use of open- and closed-ended tasks; (6) the frequency and nature of creativity-oriented tasks provided by teachers; (7) the importance of professional development and instructional guidance; and (8) the role of textbooks in supporting creativity.

Descriptive procedures were used to present the structure of the sample and response patterns, while chi-square tests were used to examine selected distributions of teachers' responses. Statistical significance was interpreted at the conventional level of $p < .05$. In addition to the quantitative responses, teachers' examples of problem tasks were considered qualitatively in order to identify recurring methodological characteristics and difficulties in task formulation.

3. RESULTS

The sample consisted of 46 teachers. Women represented 32 participants (88.9%), while men represented 4 participants (11.1%). Fourteen teachers (38.9%) were from the branch school in Kuljani, eight (22.2%) from the central school in Zalužani and fourteen (38.9%) from the branch school in Priječani.

Regarding the presence of creativity-oriented problem tasks in mathematics textbooks, the distribution of responses was not statistically significant, $\chi^2(2)=5.167$, $p=.076$. Although many teachers perceived textbooks as containing tasks that can contribute to creativity, the responses were not sufficiently uniform to support the hypothesis that teachers share a common perception on this issue.

A statistically significant difference was found in teachers' responses concerning the frequency of using problem tasks intended to develop creativity, $\chi^2(2)=10.500$, $p=.005$. Most teachers reported that they use such tasks very often or often, while a smaller group reported a moderate frequency. This finding suggests that teachers recognise the value of problem tasks, although frequency of use alone does not indicate the cognitive quality or openness of the tasks.

Teachers also expressed a strongly differentiated view of the contribution of initial mathematics teaching and problem tasks to creativity, $\chi^2(4)=39.000$, $p<.001$. The largest group considered their contribution substantial, while only a small number of respondents were undecided or expressed a negative view. Furthermore, the distribution concerning the use of open- and closed-ended tasks was statistically significant, $\chi^2(3)=71.778$, $p<.001$. The largest proportion of teachers reported using both types of tasks in approximately equal measure, while smaller groups reported a predominance of one type.

The analysis of teachers' examples revealed a more important methodological issue. While teachers generally succeeded in formulating closed, structured problems, not all were able to formulate genuinely open-ended problems. Some examples remained routine or merely non-routine word problems rather than tasks with multiple strategies, multiple possible answers or substantial space for exploration. This suggests that declarative recognition of the importance of creativity is not always accompanied by sufficient procedural knowledge for designing creativity-supportive tasks.

Professional development was also statistically significant, $\chi^2(4)=11.500$, $p=.021$. Teachers predominantly viewed professional development as highly important for improving the quality and frequency of creativity-oriented problem tasks. By contrast, the distribution concerning the perceived usefulness of instructional guidance was not statistically significant, $\chi^2(3)=6.000$, $p=.112$, indicating variation in teachers' views.

Finally, teachers' responses concerning the role of textbooks differed significantly, $\chi^2(4)=10.944$, $p=.027$. The findings indicate that teachers see the textbook as an important resource for supporting creativity, while their qualitative comments simultaneously point to the need for richer and more contemporary task collections and supplementary didactic materials.

4. DISCUSSION

The findings reveal an important discrepancy between teachers' general positive attitudes toward creativity and their practical capacity to design and select tasks that genuinely support creative mathematical thinking. This distinction is consistent with recent research showing that problem-solving pedagogy can enhance creativity, but that the effects depend on the characteristics of the learning environment and the way problems are presented and explored (Zhan et al., 2024). The finding that teachers frequently use problem tasks is therefore encouraging, but frequency should be complemented by attention to openness, cognitive demand, mathematical reasoning and opportunities for multiple solutions.

The difficulty in distinguishing an open-ended problem from a routine or non-routine word problem is particularly relevant. Contemporary problem-solving research places increasing emphasis on problem formulation, exploration and the organisation of learning environments in which pupils can make meaningful decisions about how to approach a problem (Santos-Trigo, 2024). Similarly, research with primary-school teachers indicates that sustained engagement with open-ended tasks within professional development can influence teachers' meanings of problem solving and mathematics learning (Sevinç et al., 2024). These findings support the present study's conclusion that professional development should not be limited to theoretical information about creativity; it should include analysing, transforming and creating tasks, followed by reflection on pupils' possible strategies and responses.

The regional evidence is also relevant. Sabo Junger et al. (2025) report differences in the integration of mathematical modelling tasks in primary education in Croatia and Slovenia, highlighting the importance of teacher competence and the selection of appropriate tasks. Doz et al. (2024) similarly emphasise the relevance of problem-based approaches in primary mathematics education. Taken together, these

findings suggest that textbook reform, professional development and access to task-rich methodological resources should be considered as interconnected measures rather than isolated interventions.

5. CONCLUSION

The study indicates that teachers generally recognise the connection between mathematics, problem solving and creativity and report frequent use of problem tasks. At the same time, the qualitative analysis shows that a positive attitude does not necessarily imply sufficient competence for designing genuinely open-ended, creativity-oriented tasks. The statistically significant findings concerning task use, the perceived contribution of problem tasks, the balance of open and closed tasks, professional development and textbooks point to several practical directions for improving primary mathematics education.

Priority should be given to professional development that enables teachers to distinguish closed, non-routine and open-ended problems; redesign textbook tasks; create tasks with multiple strategies or solutions; and facilitate classroom discussion, argumentation and comparison of mathematical ideas. Contemporary research supports the view that creative problem solving can be developed in primary education when pupils are provided with appropriate opportunities to generate and refine ideas (Van Hooijdonk et al., 2023). Accordingly, improving the quality of problem-solving tasks and strengthening teachers' methodological competence should be treated as important conditions for a more creative and intellectually stimulating mathematics classroom.

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